1. Find the sum of the infinite geometric series

$$\frac{2}{3}-\frac{4}{9}+\frac{8}{27}-\frac{16}{81}+...$$

Working:

Answer:

.....

(Total 4 marks)

2. From January to September, the mean number of car accidents per month was 630. From October to December, the mean was 810 accidents per month.

What was the mean number of car accidents per month for the whole year?

Working:

Answer:

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(Total 6 marks)

3. Find the sum of the arithmetic series

$$17 + 27 + 37 + ... + 417.$$

Working:

Answer:

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(Total 4 marks)

4. Gwendolyn added the multiples of 3, from 3 to 3750 and found that

$$3 + 6 + 9 + \ldots + 3750 = s.$$

Calculate s.

Working:

Answer:

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(Total 6 marks)

5. At a conference of 100 mathematicians there are 72 men and 28 women. The men have a mean height of 1.79 m and the women have a mean height of 1.62 m. Find the mean height of the 100 mathematicians.

Working:

Answer:

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(Total 4 marks)

6. Consider the infinite geometric sequence 25, 5, 1, 0.2, … .

(a) Find the common ratio.

(b) Find

(i) the 10^{th} term;

(ii) an expression for the n^{th} term.

(c) Find the sum of the infinite sequence.

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(Total 6 marks)

7. Three positive integers a, b, and c, where $a < b < c$, are such that their median is 11, their mean is 9 and their range is 10. Find the value of a.

Working:

Answer:

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(Total 6 marks)

8. The mean of the population $x_1, x_2, \ldots\ldots, x_{25}$ is m. Given that $\sum_{i=1}^{25} x_i = 300$ and

$\sum_{i=1}^{25} (x_i - m)^2 = 625$, find

(a) the value of m;

(b) the standard deviation of the population.

Working:

Answers:

(a) .....

(b) .....

(Total 4 marks)

9. The first three terms of an arithmetic sequence are 7, 9.5, 12.

(a) What is the 41st term of the sequence?

(b) What is the sum of the first 101 terms of the sequence?

Working:

Answers:

(a) .....

(b) .....

(Total 4 marks)

10. The first four terms of a sequence are 18, 54, 162, 486.

(a) Use all four terms to show that this is a geometric sequence.

(2)

(b) (i) Find an expression for the n^{th} term of this geometric sequence.

(ii) If the n^{th} term of the sequence is 1062 882, find the value of n.

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(4)
(Total 6 marks)

11. In an arithmetic sequence, the first term is 5 and the fourth term is 40. Find the second term.

Working:

Answer:

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(Total 4 marks)

12. Consider the arithmetic sequence 2, 5, 8, 11, ...

(a) Find u_{101}.

(3)

(b) Find the value of n so that $u_n = 152$.

(3)

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(Total 6 marks)

13. Let a, b, c and d be integers such that $a < b$, $b < c$ and $c = d$.

The mode of these four numbers is 11.
The range of these four numbers is 8.
The mean of these four numbers is 8.

Calculate the value of each of the integers a, b, c, d.

Working:

Answers:

a = ..., b = ...

c = ..., d = ...

(Total 6 marks)

14. Arturo goes swimming every week. He swims 200 metres in the first week. Each week he swims 30 metres more than the previous week. He continues for one year (52 weeks).

(a) How far does Arturo swim in the final week?

(b) How far does he swim altogether?

Working:

Answers:

(a) .....

(b) .....

(Total 6 marks)

15. Let S_n be the sum of the first n terms of an arithmetic sequence, whose first three terms are u_1, u_2 and u_3. It is known that $S_1 = 7$, and $S_2 = 18$.

(a) Write down u_1.

(b) Calculate the common difference of the sequence.

(c) Calculate u_4.

Working:

Answers:

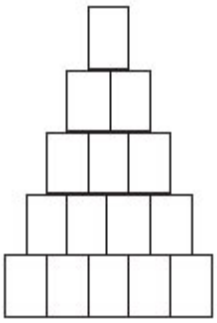
(a) .....

(b) .....

(c) .....

(Total 6 marks)

16. Clara organizes cans in triangular piles, where each row has one less can than the row below. For example, the pile of 15 cans shown has 5 cans in the bottom row and 4 cans in the row above it.



(a) A pile has 20 cans in the bottom row. Show that the pile contains 210 cans.

(4)

(b) There are 3240 cans in a pile. How many cans are in the bottom row?

(4)

(c) (i) There are S cans and they are organized in a triangular pile with n cans in the bottom row. Show that $n^2 + n - 2S = 0$.

(ii) Clara has 2100 cans. Explain why she cannot organize them in a triangular pile.

(6)

(Total 14 marks)